

SEQUENCE LISTING

(1) GENERAL INFORMATION:

(i) APPLICANT:

- (A) NAME: National Starch and Chemical Investment Holding Corporation
- (B) STREET: 501 Silverside Road, Suite 27
- (C) CITY: Wilmington
- (D) STATE: Delaware
- (E) COUNTRY: United States of America
- (F) POSTAL CODE (ZIP): 19809

(ii) TITLE OF INVENTION: Improvements in or Relating to Plant Starch Composition

(iii) NUMBER OF SEQUENCES: 20

(iv) COMPUTER READABLE FORM:

- (A) MEDIUM TYPE: Floppy disk
- (B) COMPUTER: IBM PC compatible
- (C) OPERATING SYSTEM: PC-DOS/MS-DOS
- (D) SOFTWARE: PatentIn Release #1.0, Version #1.30 (EPO)

(2) INFORMATION FOR SEQ ID NO: 1:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 57 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

AAGGATCCGT CGACATCGAT AATACGACTC ACTATAGGGA TTTTTTTTTT
TTTTTT 57

(2) INFORMATION FOR SEQ ID NO: 2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 2:

AAGGATCCGT CGACATC

17

(2) INFORMATION FOR SEQ ID NO: 3:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 3:

GACATCGATA ATACGAC

17

(2) INFORMATION FOR SEQ ID NO: 4:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 4:

CATCCAACCA CCATCTCGCA

20

(2) INFORMATION FOR SEQ ID NO: 5:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 5:

TTGAGAGAAG ATACCTAAGT

20

(2) INFORMATION FOR SEQ ID NO: 6:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 6:

ATGTTTCAGTC CATCTAAAGT

20

(2) INFORMATION FOR SEQ ID NO: 7:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 7:

AGAACAACAA TTCCTAGCTC

20

(2) INFORMATION FOR SEQ ID NO: 8:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 8:

GGGGCCTTGA ACTCAGCAAT

20

(2) INFORMATION FOR SEQ ID NO: 9:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 20 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 9:

CGTCCCAGCA TTCGACATAA

20

(2) INFORMATION FOR SEQ ID NO: 10:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 26 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 10:

CTTGGATCCT TGAACTCAGC AATTTG

26

(2) INFORMATION FOR SEQ ID NO: 11:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 29 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 11:

TAACTCGAGC AACGCGATCA CAAGTTCGT

29

(2) INFORMATION FOR SEQ ID NO: 12:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 3003 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 12:

GATGGGGCCT TGAACTCAGC AATTTGACAC TCAGTTAGTT ACACTGCCAT
CACTTATCAG 60

ATCTCTATTT TTTCTCTTAA TTCCAACCAA GGAATGAATA AAAAGATAGA
TTTGTAAGAAA 120

CCCTAAGGAG AGAAGAAGAA AGATGGTGTA TACACTCTCT GGAGTTCGTT
TTCCTACTGT 180

TCCATCAGTG TACAAATCTA ATGGATTCAG CAGTAATGGT GATCGGAGGA
ATGCTAATAT 240

TTCTGTATTC TTGAAAAAAC ACTCTCTTTC ACGGAAGATC TTGGCTGAAA
AGTCTTCTTA 300

CAATTCCGAA TCCCGACCTT CTACAATTGC AGCATCGGGG AAAGTCCTTG
TGCCTGGAAT 360

CCAGAGTGAT AGCTCCTCAT CCTCAACAGA TCAATTTGAG TTCGCTGAGA
CATCTCCAGA 420

AAATTCCCCA GCATCAACTG ATGTAGATAG TTCAACAATG GAACACGCTA
GCCAGATTAA 480

AACTGAGAAC GATGACGTTG AGCCGTCAAG TGATCTTACA
GGAAGTGTTG AAGAGCTGGA 540

TTTTGCTTCA TCACTACAAC TACAAGAAGG TGGTAAACTG GAGGAGTCTA
AAACATTAAA 600

TACTTCTGAA GAGACAATTA TTGATGAATC TGATAGGATC AGAGAGAGGG
GCATCCCTCC 660

ACCTGGACTT GGTCAGAAGA TTTATGAAAT AGACCCCCTT TTGACAAACT
ATCGTCAACA 720

CCTTGATTAC AGGTATTCAC AGTACAAGAA ACTGAGGGAG GCAATTGACA
AGTATGAGGG 780

TGGTTTGGAA GCTTTTTCTC GTGGTTATGA AAGAATGGGT TTCACTCGTA
GTGCTACAGG 840

TATCACTTAC CGTGAGTGGG CTCCTGGTGC CCAGTCAGCT
GCCCTCATTG GGGATTTCOA 900

CAATTGGGAC GCAAATGCTG ACTTTATGAC TCGGAATGAA TTTGGTGTCT
GAGAGATTTT 960

TCTGCCAAAT AATGTGGATG GTTCTCCTGC AATTCCTCAT GGGTCCAGAG
TGAAGATACG 1020

TATGGACACT CCATCAGGTG TTAAGGATTC CATTCTGCT TGGATCAACT
ACTCTTTACA 1080

GCTTCCTGAT GAAATTCCAT ATAATGGAAT ATATTATGAT CCACCCGAAG
AGGAGAGGTA 1140

TATCTTCCAA CACCCACGGC CAAAGAAACC AAAGTCGGTG AGAATATATG
AATCTCATAT 1200

TGGAATGAGT AGTCCGGAGC CTAAAATTAA CTCATACGTG AATTTTAGAG
ATGAAGTTCT 1260

TCCTCGCATA AAAAAAGCTT GGGTACAATG CGGTGCAAAT TATGGCTATT
CAAGAGCATT 1320

CTTATTATGC TAGTTTTGGT TATCATGTCA CAAATTTTTT TGCACCAAGC
AGCCGTTTTG 1380

GAACGCCCGA CGACCTTAAG TCTTTGATTG ATAAAGCTCA TGAGCTAGGA
ATTGTTGTTC 1440

TCATGGACAT TGTTACAGC CATGCATCAA ATAATACTTT AGATGGACTG
AACATGTTTG 1500

ACGGCACAGA TAGTTGTTAC TTCACTCTG GAGCTCGTGG TTATCATTGG
ATGTGGGATT 1560

TCCGCCTCTT TAACTATGGA AACTGGGAGG TACTTAGGTA TCTTCTCTCA
AATGCGAGAT 1620

GGTGGTTGGA TGAGTTCAAA TTTGATGGAT TTAGATTGA TGGTGTGACA
TCAATGATGT 1680

GTACTACCA CGGATTATCG GTGGGATTCA CTGGGAACTA
CGAGGAATAC TTTGGACTCG 1740

CAACTGATGT GGATGCTGTT GTGTATCTGA TGCTGGTCAA CGATCTTATT
CATGGGCTTT 1800

TCCCAGATGC AATTACCATT GGTGAAGATG TTAGCGGAAT GCCGACATT
TGTGTTCCCG 1860

TTCAAGATGG GGGTGTTGGC TTTGACTATC GGCTGCATAT GGCAATTGCT
GATAAATGGA 1920

TTGAGTTGCT CAAGAAACGG GATGAGGATT GGAGAGTGGG
TGATATTGTT CATACACTGA 1980

CAAATAGAAG ATGGTCGGAA AAGTGTGTTT CATACGCTGA AAGTCATGAT
CAAGCTCTAG 2040

TCGGTGATAA AACTATAGCA TTCTGGCTGA TGGACAAGGA TATGTATGAT
TTTATGGCTC 2100

TGGATAGACC GTCAACATCA TTAATAGATC GTGGGATAGC ATTACACAAG
ATGATTAGGC 2160

TTGTAACAT GGGATTAGGA GGAGAAGGGT ACCTAAATTT CATGGGAAAT
GAATTCGGCC 2220

ACCCTGAGTG GATTGATTTC CCTAGGGCTG AACAACACCT CTCTGATGGC
TCAGTAATTC 2280

CCAGAAACCA ATTCAGTTAT GATAAATGCA GACGGAGATT TGACCTGGGA
GATGCAGAAT 2340

ATTTAAGATA CCGTGGGTTG CAAGAATTTG ACCGGGCTAT GCAGTATCTT
GAAGATAAAT 2400

ATGAGTTTAT GACTTCAGAA CACCAGTTCA TATCACGAAA GGATGAAGGA
GATAGGATGA 2460

TTGTATTTGA AAAAGGAAAC CTAGTTTTTG TCTTTAATTT TCACTGGACA
AAAGGCTATT 2520

CAGACTATCG CATAGGCTGC CTGAAGCCTG GAAAATACAA
GGTTGCCTTG GACTCAGATG 2580

ATCCACTTTT TGGTGGCTTC GGGAGAATTG ATCATAATGC CGAATATTTT
ACCTTTGAAG 2640

GATGGTATGA TGATCGTCCT CGTTCAATTA TGGTGTATGC ACCTAGTAGA
ACAGCAGTGG 2700

TCTATGCACT AGTAGACAAA GAAGAAGAAG AAGAAGAAGA AGTAGCAGTA
GTAGAAGAAG 2760

TAGTAGTAGA AGAAGAATGA ACGAACTTGT GATCGCGTTG AAAGATTTGA
ACGCCACATA 2820

GAGCTTCTTG ACGTATCTGG CAATATTGCA TTAGTCTTGG CGGAATTTCA
TGTGACAACA 2880

GGTTTGCAAT TCTTTCCACT ATTAGTAGTG CAACGATATA CGCAGAGATG
AAGTGCTGAA 2940

CAAAACATA TGTAATCG ATGAATTAT GTCGAATGCT GGGACGATCG
AATTCCTGCA 3000

GCC

3003

(2) INFORMATION FOR SEQ ID NO: 13:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 2975 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 13:

TTGATGGGCC TTGAACTCAG CAATTTGACA CTCAGTTAGT TACACTCCTA
TCACTTATCA 60

GATCTCTATT TTTTCTCTTA ATTCCAACCA GGGGAATGAA TAAAAGGATA
GATTTGTAAA 120

AACCCTAAGG AGAGAAGAAG AAAGATGGTG TATATACTCT CTGGAGTTCG
TTTTCCTACT 180

GTTCCATCAG TGTACAAATC TAATGGATTC AGCAGTAATG GTGATCGGAG
GAATGCTAAT 240

GTTTCTGTAT TCTTGAAAAA GCACTCTCTT TCACGGAAGA TCTTGGCTGA
AAAGTCTTCT 300

TACAATTCCG AATTCCGACC TTCTACAGTT GCAGCATCGG GGAAAGTCCT
TGTGCCTGGA 360

ACCCAGAGTG ATAGCTCCTC ATCCTCAACA GACCAATTTG AGTTCACTGA
GACATCTCCA 420

GAAAATTCCC CAGCATCAAC TGATGTAGAT AGTTCAACAA TGGAACACGC
TAGCCAGATT 480

AAACTGAGA ACGATGACGT TGAGCCGTCA AGTGATCTTA
CAGGAAGTGT TGAAGAGCTG 540

GATTTTGCTT CATCACTACA ACTACAAGAA GGTGGTAAAC TGGAGGAGTC
TAAACATTA 600

AATACTTCTG AAGAGACAAT TATTGATGAA TCTGATAGGA TCAGAGAGAG
GGGCATCCCT 660

CCACCTGGAC TTGGTCAGAA GATTTATGAA ATAGACCCCC TTTTGACAAA
CTATCGTCAA 720

CACCTTGATT ACAGGTATTC ACAGTACAAG AAAGTGGGG AGGCAATTGA
CAAGTATGAG 780

GGTGGTTTGG AAGCTTTTCT CGTGGTTATG AAAAAATGGG TTCACTCGT
AGTGCTACAG 840

GTATCACTTA CCGTGAGTGG GCTCCTGGTG CCCAGTCAGC
TGCCCTCATT GGAGATTTCA 900

ACAATTGGGA CGCAAATGCT GACATTATGA CTCGGAATGA ATTTGGTGTC
TGGGAGATTT 960

TTCTGCCAAA TAATGTGGAT GGTTCCTCTG CAATTCCTCA TGGGTCCAGA
GTGAAGATAC 1020

GTATGGACAC TCCATCAGGT GTTAAGGATT CCATTCCTGC TTGGATCAAC
TACTCTTTAC 1080

AGCTTCCTGA TGAAATTCCA TATAATGGAA TATATTATGA TCCACCCGAA
GAGGAGAGGT 1140

ATATCTTCCA ACACCCACGG CCAAAGAAAC CAAAGTCGCT GAGAATATAT
GAATCTCATA 1200

TTGGAATGAG TAGTCCGGAG CCTAAAATTA ACTCATACGT GAATTTTAGA
GATGAAGTTC 1260

TTCCTCGCAT AAAAAAGCTT GGGTACAATG CGCTGCGAAT TATGGCTATT
CAAGAGCATT 1320

CTTATTATGC TAGTTTTGGT TATCATGTCA CAAATTTTTT TGCACCAAGC
AGCCGTTTTG 1380

GAACGCCCGA CGACCTTAAG TCTTCGATTG ATAAAGCTCA TGAGCTAGGA
ATTGTTGTTC 1440

TCATGGACAT CGTTCACAGC CATGCATCAA ATAATACTTT AGATGGACTG
AACATGTTTG 1500

ACGGCACCGA TAGTTGTTAC TTCACTCTG GAGCTCGTGG TTATCATTGG
ATGTGGGATT 1560

CCGCCTCTTT AACTATGGAA ACTGGGAGGT ACTTAGGTAT CTTCTCTCAA
ATGCGAGATG 1620

GTGGTTGGAT GAGTTCAAAT TTGATGGATT TAGATTCGAT GGTGTGACAT
CAATGATGTA 1680

TACTCACCAC GGATTATCGG TGGGATTCAC TGGGAACACTAC GAGGAATACT
TTGGACTCGC 1740

AACTGATGTG GATGCTGTTG TGTATCTGAT GCTGGTCAAC GATCTTATTC
ATAGGCTTTT 1800

CCCAGATGCA ATTACCATTG GTGAAGATGT TAGCGGAATG CCGACATTTT
GTATTCCCGT 1860

TCAAGATGGG GGTGTTGGCT TTGACTATCG GCTGCATATG
GCAATTGCTG ATAAATGGAT 1920

TGAGTTGCTC AAGAAACGGG ATGAGGATTG GAGAGTGGGT
GATATTGTTT ATACACTGAC 1980

AAATAGAAGA TGGTCGGAAA AGTGTGTTTC ATACGCTGAA AGTCATGATC
AAGCTCTAGT 2040

CGGTGATAAA ACTATAGCAT TCTGGCTGAT GGACAAGGAT ATGTATGATT
TTATGGCTCT 2100

GGATAGACCG CCAACATCAT TAATAGATCG TGGGATAGCA TTGCACAAGA
TGATTAGGCT 2160

TGTAACATATG GGATTAGGAG GAGAAGGGTA CCTAAATTTT ATGGGAAATG
AATTCGGCCA 2220

CCCTGAGTGG ATTGATTTCC CTAGGGCTGA GCCACACCTT TCTGATGGCT
CAGTAATTCC 2280

CGGAAACCAA TTCAGTTATG ATAAATGCAG ACGGAGATTT
GACCTGGGAG ATGCAGAATA 2340

TTTAAGATAC CATGGGTTAC AAGAATTTGA CTGGGCTATG CAGTATCTTG
AAGATAAATA 2400

TGAGTTTATG ACTTCAGAAC ACCAGTTCAT ATCACGAAAG GATGAAGGAG
ATAGGATGAT 2460

TGTATTTGAA AGAGGAAACC TAGTTTTCGT CTTTAATTTT CACTGGACAA
ATAGCTATTC 2520

AGACTATCGC ATAGGCTGCC TGAAGCCTGG AAAATACAAG
GTTGTCTTGG ACTCAGATGA 2580

TCCACTTTTT GGTGGCTTCG GGAGAATTGA TCATAATGCC GAATATTTCA
CCTCTGAAGG 2640

ATCGTATGAT GATCGTCCTT GTTCAATTAT GGTGTATGCA CCTAGTAGAA
CAGCAGTGGT 2700

CTATGCACTA GTAGACAAAC TAGAAGTAGC AGTAGTAGAA GAACCCATTG
AAGAATGAAC 2760

GAAC TTGTGA TCGCGTTGAA AGATTTGAAC GTTACTTGGT CATCCACATA
GAGCTTCTTG 2820

ACATCAGTCT TGGCGGAATT GCATGTGACA ACAAGGTTTG CAGTTCTTTC
CACTATTAGT 2880

AGTCCACCGA TATACGCAGA GATGAAGTGC TGAACAAACA TATGTAAAAT
CGATGAATTT 2940

ATGTCGAATG CTGGGACGAT CGAATTCCTG CAGCC
2975

(2) INFORMATION FOR SEQ ID NO: 14:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 3033 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 145..2790

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 14:

TTGATGGGGC CTTGAACTCA GCAATTTGAC ACTCAGTTAG TTACACTCCT
ATCACTTATC 60

AGATCTCTAT TTTTCTCTT AATTCCAACC AAGGAATGAA TAAAAGGATA
GATTGTAAA 120

AACCCTAAGG AGAGAAGAAG AAAG ATG GTG TAT ACA CTC TCT GGA
GTT CGT 171

Met Val Tyr Thr Leu Ser Gly Val Arg
1 5

TTT CCT ACT GTT CCA TCA GTG TAC AAA TCT AAT GGA TTC AGC AGT
AAT 219

Phe Pro Thr Val Pro Ser Val Tyr Lys Ser Asn Gly Phe Ser Ser Asn
10 15 20 25

GGT GAT CGG AGG AAT GCT AAT GTT TCT GTA TTC TTG AAA AAG CAC
TCT 267

Gly Asp Arg Arg Asn Ala Asn Val Ser Val Phe Leu Lys Lys His Ser
30 35 40

CTT TCA CGG AAG ATC TTG GCT GAA AAG TCT TCT TAC AAT TCC GAA
TTC 315

Leu Ser Arg Lys Ile Leu Ala Glu Lys Ser Ser Tyr Asn Ser Glu Phe
45 50 55

CGA CCT TCT ACA GTT GCA GCA TCG GGG AAA GTC CTT GTG CCT GGA
ACC 363

Arg Pro Ser Thr Val Ala Ala Ser Gly Lys Val Leu Val Pro Gly Thr
60 65 70

CAG AGT GAT AGC TCC TCA TCC TCA ACA GAC CAA TTT GAG TTC ACT
GAG 411

Gln Ser Asp Ser Ser Ser Ser Thr Asp Gln Phe Glu Phe Thr Glu
75 80 85

ACA TCT CCA GAA AAT TCC CCA GCA TCA ACT GAT GTA GAT AGT TCA
ACA 459

Thr Ser Pro Glu Asn Ser Pro Ala Ser Thr Asp Val Asp Ser Ser Thr
90 95 100 105

ATG GAA CAC GCT AGC CAG ATT AAA ACT GAG AAC GAT GAC GTT GAG
CCG 507
Met Glu His Ala Ser Gln Ile Lys Thr Glu Asn Asp Asp Val Glu Pro
110 115 120

TCA AGT GAT CTT ACA GGA AGT GTT GAA GAG CTG GAT TTT GCT TCA
TCA 555
Ser Ser Asp Leu Thr Gly Ser Val Glu Glu Leu Asp Phe Ala Ser Ser
125 130 135

CTA CAA CTA CAA GAA GGT GGT AAA CTG GAG GAG TCT AAA ACA TTA
AAT 603
Leu Gln Leu Gln Glu Gly Gly Lys Leu Glu Glu Ser Lys Thr Leu Asn
140 145 150

ACT TCT GAA GAG ACA ATT ATT GAT GAA TCT GAT AGG ATC AGA GAG
AGG 651
Thr Ser Glu Glu Thr Ile Ile Asp Glu Ser Asp Arg Ile Arg Glu Arg
155 160 165

GGC ATC CCT CCA CCT GGA CTT GGT CAG AAG ATT TAT GAA ATA GAC
CCC 699
Gly Ile Pro Pro Pro Gly Leu Gly Gln Lys Ile Tyr Glu Ile Asp Pro
170 175 180 185

CTT TTG ACA AAC TAT CGT CAA CAC CTT GAT TAC AGG TAT TCA CAG
TAC 747
Leu Leu Thr Asn Tyr Arg Gln His Leu Asp Tyr Arg Tyr Ser Gln Tyr
190 195 200

AAG AAA CTG AGG GAG GCA ATT GAC AAG TAT GAG GGT GGT TTG GAA
GCC 795
Lys Lys Leu Arg Glu Ala Ile Asp Lys Tyr Glu Gly Gly Leu Glu Ala
205 210 215

TTT TCT CGT GGT TAT GAA AAA ATG GGT TTC ACT CGT AGT GCT ACA
GGT 843
Phe Ser Arg Gly Tyr Glu Lys Met Gly Phe Thr Arg Ser Ala Thr Gly
220 225 230

ATC ACT TAC CGT GAG TGG GCT CTT GGT GCC CAG TCA GCT GCC CTC
ATT 891
Ile Thr Tyr Arg Glu Trp Ala Leu Gly Ala Gln Ser Ala Ala Leu Ile
235 240 245

GGA GAT TTC AAC AAT TGG GAC GCA AAT GCT GAC ATT ATG ACT CGG
AAT 939
Gly Asp Phe Asn Asn Trp Asp Ala Asn Ala Asp Ile Met Thr Arg Asn
250 255 260 265

GAA TTT GGT GTC TGG GAG ATT TTT CTG CCA AAT AAT GTG GAT GGT
TCT 987
Glu Phe Gly Val Trp Glu Ile Phe Leu Pro Asn Asn Val Asp Gly Ser
270 275 280

CCT GCA ATT CCT CAT GGG TCC AGA GTG AAG ATA CGT ATG GAC ACT
CCA 1035
Pro Ala Ile Pro His Gly Ser Arg Val Lys Ile Arg Met Asp Thr Pro
285 290 295

TCA GGT GTT AAG GAT TCC ATT CCT GCT TGG ATC AAC TAC TCT TTA
CAG 1083
Ser Gly Val Lys Asp Ser Ile Pro Ala Trp Ile Asn Tyr Ser Leu Gln
300 305 310

CTT CCT GAT GAA ATT CCA TAT AAT GGA ATA CAT TAT GAT CCA CCC
GAA 1131
Leu Pro Asp Glu Ile Pro Tyr Asn Gly Ile His Tyr Asp Pro Pro Glu
315 320 325

GAG GAG AGG TAT ATC TTC CAA CAC CCA CGG CCA AAG AAA CCA AAG
TCG 1179
Glu Glu Arg Tyr Ile Phe Gln His Pro Arg Pro Lys Lys Pro Lys Ser
330 335 340 345

CTG AGA ATA TAT GAA TCT CAT ATT GGA ATG AGT AGT CCG GAG CCT
AAA 1227
Leu Arg Ile Tyr Glu Ser His Ile Gly Met Ser Ser Pro Glu Pro Lys
350 355 360

ATT AAC TCA TAC GTG AAT TTT AGA GAT GAA GTT CTT CCT CGC ATA
AAA 1275
Ile Asn Ser Tyr Val Asn Phe Arg Asp Glu Val Leu Pro Arg Ile Lys
365 370 375

AAG CTT GGG TAC AAT GCG CTG CAA ATT ATG GCT ATT CAA GAG CAT
TCT 1323
Lys Leu Gly Tyr Asn Ala Leu Gln Ile Met Ala Ile Gln Glu His Ser
380 385 390

TAT TAC GCT AGT TTT GGT TAT CAT GTC ACA AAT TTT TTT GCA CCA
AGC 1371
Tyr Tyr Ala Ser Phe Gly Tyr His Val Thr Asn Phe Phe Ala Pro Ser
395 400 405

AGC CGT TTT GGA ACG CCC GAC GAC CTT AAG TCT TTG ATT GAT AAA
GCT 1419
Ser Arg Phe Gly Thr Pro Asp Asp Leu Lys Ser Leu Ile Asp Lys Ala
410 415 420 425

CAT GAG CTA GGA ATT GTT GTT CTC ATG GAC ATT GTT CAC AGC CAT
GCA 1467
His Glu Leu Gly Ile Val Val Leu Met Asp Ile Val His Ser His Ala
430 435 440

TCA AAT AAT ACT TTA GAT GGA CTG AAC ATG TTT GAC TGC ACC GAT
AGT 1515
Ser Asn Asn Thr Leu Asp Gly Leu Asn Met Phe Asp Cys Thr Asp Ser
445 450 455

TGT TAC TTT CAC TCT GGA GCT CGT GGT TAT CAT TGG ATG TGG GAT
TCC 1563
Cys Tyr Phe His Ser Gly Ala Arg Gly Tyr His Trp Met Trp Asp Ser
460 465 470

CGC CTC TTT AAC TAT GGA AAC TGG GAG GTA CTT AGG TAT CTT CTC
TCA 1611
Arg Leu Phe Asn Tyr Gly Asn Trp Glu Val Leu Arg Tyr Leu Leu Ser
475 480 485

AAT GCG AGA TGG TGG TTG GAT GCG TTC AAA TTT GAT GGA TTT AGA
TTT 1659
Asn Ala Arg Trp Trp Leu Asp Ala Phe Lys Phe Asp Gly Phe Arg Phe
490 495 500 505

GAT GGT GTG ACA TCA ATG ATG TAT ATT CAC CAC GGA TTA TCG GTG
GGA 1707
Asp Gly Val Thr Ser Met Met Tyr Ile His His Gly Leu Ser Val Gly
510 515 520

TTC ACT GGG AAC TAC GAG GAA TAC TTT GGA CTC GCA ACT GAT GTG
GAT 1755
Phe Thr Gly Asn Tyr Glu Glu Tyr Phe Gly Leu Ala Thr Asp Val Asp
525 530 535

GCT GTT GTG TAT CTG ATG CTG GTC AAC GAT CTT ATT CAT GGG CTT
TTC 1803
Ala Val Val Tyr Leu Met Leu Val Asn Asp Leu Ile His Gly Leu Phe
540 545 550

CCA GAT GCA ATT ACC ATT GGT GAA GAT GTT AGC GGA ATG CCG ACA
TTT 1851
Pro Asp Ala Ile Thr Ile Gly Glu Asp Val Ser Gly Met Pro Thr Phe
555 560 565

TGT ATT CCC GTC CAA GAG GGG GGT GTT GGC TTT GAC TAT CGG CTG
CAT 1899
Cys Ile Pro Val Gln Glu Gly Gly Val Gly Phe Asp Tyr Arg Leu His
570 575 580 585

ATG GCA ATT GCT GAT AAA CGG ATT GAG TTG CTC AAG AAA CGG GAT
GAG 1947
Met Ala Ile Ala Asp Lys Arg Ile Glu Leu Leu Lys Lys Arg Asp Glu
590 595 600

GAT TGG AGA GTG GGT GAT ATT GTT CAT ACA CTG ACA AAT AGA AGA
TGG 1995
Asp Trp Arg Val Gly Asp Ile Val His Thr Leu Thr Asn Arg Arg Trp
605 610 615

TCG GAA AAG TGT GTT TCA TAC GCT GAA AGT CAT GAT CAA GCT CTA
GTC 2043
Ser Glu Lys Cys Val Ser Tyr Ala Glu Ser His Asp Gln Ala Leu Val
620 625 630

GGT GAT AAA ACT ATA GCA TTC TGG CTG ATG GAC AAG GAT ATG TAT
GAT 2091
Gly Asp Lys Thr Ile Ala Phe Trp Leu Met Asp Lys Asp Met Tyr Asp
635 640 645

TTT ATG GCT CTG GAT AGA CCG TCA ACA TCA TTA ATA GAT CGT GGG
ATA 2139
Phe Met Ala Leu Asp Arg Pro Ser Thr Ser Leu Ile Asp Arg Gly Ile
650 655 660 665

GCA TTG CAC AAG ATG ATT AGG CTT GTA ACT ATG GGA TTA GGA GGA
GAA 2187
Ala Leu His Lys Met Ile Arg Leu Val Thr Met Gly Leu Gly Gly Glu
670 675 680

GGG TAC CTA AAT TTC ATG GGA AAT GAA TTC GGC CAC CCT GAG TGG
ATT 2235
Gly Tyr Leu Asn Phe Met Gly Asn Glu Phe Gly His Pro Glu Trp Ile
685 690 695

GAT TTC CCT AGG GCT GAA CAA CAC CTC TCT GAT GGC TCA GTA ATC
CCC 2283
Asp Phe Pro Arg Ala Glu Gln His Leu Ser Asp Gly Ser Val Ile Pro
700 705 710

GGA AAC CAA TTC AGT TAT GAT AAA TGC AGA CGG AGA TTT GAC CTG
GGA 2331
Gly Asn Gln Phe Ser Tyr Asp Lys Cys Arg Arg Arg Phe Asp Leu Gly
715 720 725

GAT GCA GAA TAT TTA AGA TAC CGT GGG TTG CAA GAA TTT GAC CGG
CCT 2379
Asp Ala Glu Tyr Leu Arg Tyr Arg Gly Leu Gln Glu Phe Asp Arg Pro
730 735 740 745

ATG CAG TAT CTT GAA GAT AAA TAT GAG TTT ATG ACT TCA GAA CAC
CAG 2427
Met Gln Tyr Leu Glu Asp Lys Tyr Glu Phe Met Thr Ser Glu His Gln
750 755 760

TTC ATA TCA CGA AAG GAT GAA GGA GAT AGG ATG ATT GTA TTT GAA
AAA 2475
Phe Ile Ser Arg Lys Asp Glu Gly Asp Arg Met Ile Val Phe Glu Lys
765 770 775

GGA AAC CTA GTT TTT GTC TTT AAT TTT CAC TGG ACA AAA AGC TAT
TCA 2523
Gly Asn Leu Val Phe Val Phe Asn Phe His Trp Thr Lys Ser Tyr Ser
780 785 790

GAC TAT CGC ATA GCC TGC CTG AAG CCT GGA AAA TAC AAG GTT GCC
TTG 2571
Asp Tyr Arg Ile Ala Cys Leu Lys Pro Gly Lys Tyr Lys Val Ala Leu
795 800 805

GAC TCA GAT GAT CCA CTT TTT GGT GGC TTC GGG AGA ATT GAT CAT
AAT 2619
Asp Ser Asp Asp Pro Leu Phe Gly Gly Phe Gly Arg Ile Asp His Asn
810 815 820 825

GCC GAA TAT TTC ACC TTT GAA GGA TGG TAT GAT GAT CGT CCT CGT
TCA 2667
Ala Glu Tyr Phe Thr Phe Glu Gly Trp Tyr Asp Asp Arg Pro Arg Ser
830 835 840

ATT ATG GTG TAT GCA CCT TGT AAA ACA GCA GTG GTC TAT GCA CTA
GTA 2715
Ile Met Val Tyr Ala Pro Cys Lys Thr Ala Val Val Tyr Ala Leu Val
845 850 855

GAC AAA GAA GAA GAA GAA GAA GAA GAA GAA GAA GAA GTA GCA
GCA 2763
Asp Lys Glu Glu Glu Glu Glu Glu Glu Glu Glu Val Ala Ala
860 865 870

GTA GAA GAA GTA GTA GTA GAA GAA GAA TGAACGAACT TGTGATCGCG
2810
Val Glu Glu Val Val Val Glu Glu Glu
875 880

TTGAAAGATT TGAACGCTAC ATAGAGCTTC TTGACGTATC TGGCAATATT
GCATCAGTCT 2870

TGGCGGAATT TCATGTGACA CAAGGTTTGC AATTCTTTCC ACTATTAGTA
GTGCAACGAT 2930

ATACGCAGAG ATGAAGTGCT GAACAAACAT ATGTAAAATC GATGAATTTA
TGTCGAATGC 2990

TGGGACGATC GAATTCCTGC AGGCCGGGGG ACCCCTTAGT TCT
3033

(2) INFORMATION FOR SEQ ID NO: 15:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 882 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 15:

Met Val Tyr Thr Leu Ser Gly Val Arg Phe Pro Thr Val Pro Ser Val
1 5 10 15

Tyr Lys Ser Asn Gly Phe Ser Ser Asn Gly Asp Arg Arg Asn Ala Asn
20 25 30

Val Ser Val Phe Leu Lys Lys His Ser Leu Ser Arg Lys Ile Leu Ala
35 40 45

Glu Lys Ser Ser Tyr Asn Ser Glu Phe Arg Pro Ser Thr Val Ala Ala
50 55 60

Ser Gly Lys Val Leu Val Pro Gly Thr Gln Ser Asp Ser Ser Ser Ser
65 70 75 80

Ser Thr Asp Gln Phe Glu Phe Thr Glu Thr Ser Pro Glu Asn Ser Pro
85 90 95

Ala Ser Thr Asp Val Asp Ser Ser Thr Met Glu His Ala Ser Gln Ile
100 105 110

Lys Thr Glu Asn Asp Asp Val Glu Pro Ser Ser Asp Leu Thr Gly Ser
115 120 125

Val Glu Glu Leu Asp Phe Ala Ser Ser Leu Gln Leu Gln Glu Gly Gly
130 135 140

Lys Leu Glu Glu Ser Lys Thr Leu Asn Thr Ser Glu Glu Thr Ile Ile
145 150 155 160

Asp Glu Ser Asp Arg Ile Arg Glu Arg Gly Ile Pro Pro Pro Gly Leu
165 170 175

Gly Gln Lys Ile Tyr Glu Ile Asp Pro Leu Leu Thr Asn Tyr Arg Gln
180 185 190

His Leu Asp Tyr Arg Tyr Ser Gln Tyr Lys Lys Leu Arg Glu Ala Ile
195 200 205

Asp Lys Tyr Glu Gly Gly Leu Glu Ala Phe Ser Arg Gly Tyr Glu Lys
210 215 220

Met Gly Phe Thr Arg Ser Ala Thr Gly Ile Thr Tyr Arg Glu Trp Ala
225 230 235 240

Leu Gly Ala Gln Ser Ala Ala Leu Ile Gly Asp Phe Asn Asn Trp Asp
245 250 255

Ala Asn Ala Asp Ile Met Thr Arg Asn Glu Phe Gly Val Trp Glu Ile

260	265	270
Phe Leu Pro Asn Asn Val Asp Gly Ser Pro Ala Ile Pro His Gly Ser		
275	280	285
Arg Val Lys Ile Arg Met Asp Thr Pro Ser Gly Val Lys Asp Ser Ile		
290	295	300
Pro Ala Trp Ile Asn Tyr Ser Leu Gln Leu Pro Asp Glu Ile Pro Tyr		
305	310	315
Asn Gly Ile His Tyr Asp Pro Pro Glu Glu Glu Arg Tyr Ile Phe Gln		
325	330	335
His Pro Arg Pro Lys Lys Pro Lys Ser Leu Arg Ile Tyr Glu Ser His		
340	345	350
Ile Gly Met Ser Ser Pro Glu Pro Lys Ile Asn Ser Tyr Val Asn Phe		
355	360	365
Arg Asp Glu Val Leu Pro Arg Ile Lys Lys Leu Gly Tyr Asn Ala Leu		
370	375	380
Gln Ile Met Ala Ile Gln Glu His Ser Tyr Tyr Ala Ser Phe Gly Tyr		
385	390	395
His Val Thr Asn Phe Phe Ala Pro Ser Ser Arg Phe Gly Thr Pro Asp		
405	410	415
Asp Leu Lys Ser Leu Ile Asp Lys Ala His Glu Leu Gly Ile Val Val		
420	425	430
Leu Met Asp Ile Val His Ser His Ala Ser Asn Asn Thr Leu Asp Gly		
435	440	445
Leu Asn Met Phe Asp Cys Thr Asp Ser Cys Tyr Phe His Ser Gly Ala		
450	455	460
Arg Gly Tyr His Trp Met Trp Asp Ser Arg Leu Phe Asn Tyr Gly Asn		
465	470	475
Trp Glu Val Leu Arg Tyr Leu Leu Ser Asn Ala Arg Trp Trp Leu Asp		
485	490	495
Ala Phe Lys Phe Asp Gly Phe Arg Phe Asp Gly Val Thr Ser Met Met		
500	505	510

Tyr Ile His His Gly Leu Ser Val Gly Phe Thr Gly Asn Tyr Glu Glu
515 520 525

Tyr Phe Gly Leu Ala Thr Asp Val Asp Ala Val Val Tyr Leu Met Leu
530 535 540

Val Asn Asp Leu Ile His Gly Leu Phe Pro Asp Ala Ile Thr Ile Gly
545 550 555 560

Glu Asp Val Ser Gly Met Pro Thr Phe Cys Ile Pro Val Gln Glu Gly
565 570 575

Gly Val Gly Phe Asp Tyr Arg Leu His Met Ala Ile Ala Asp Lys Arg
580 585 590

Ile Glu Leu Leu Lys Lys Arg Asp Glu Asp Trp Arg Val Gly Asp Ile
595 600 605

Val His Thr Leu Thr Asn Arg Arg Trp Ser Glu Lys Cys Val Ser Tyr
610 615 620

Ala Glu Ser His Asp Gln Ala Leu Val Gly Asp Lys Thr Ile Ala Phe
625 630 635 640

Trp Leu Met Asp Lys Asp Met Tyr Asp Phe Met Ala Leu Asp Arg Pro
645 650 655

Ser Thr Ser Leu Ile Asp Arg Gly Ile Ala Leu His Lys Met Ile Arg
660 665 670

Leu Val Thr Met Gly Leu Gly Gly Glu Gly Tyr Leu Asn Phe Met Gly
675 680 685

Asn Glu Phe Gly His Pro Glu Trp Ile Asp Phe Pro Arg Ala Glu Gln
690 695 700

His Leu Ser Asp Gly Ser Val Ile Pro Gly Asn Gln Phe Ser Tyr Asp
705 710 715 720

Lys Cys Arg Arg Arg Phe Asp Leu Gly Asp Ala Glu Tyr Leu Arg Tyr
725 730 735

Arg Gly Leu Gln Glu Phe Asp Arg Pro Met Gln Tyr Leu Glu Asp Lys
740 745 750

Tyr Glu Phe Met Thr Ser Glu His Gln Phe Ile Ser Arg Lys Asp Glu
755 760 765

Gly Asp Arg Met Ile Val Phe Glu Lys Gly Asn Leu Val Phe Val Phe
770 775 780

Asn Phe His Trp Thr Lys Ser Tyr Ser Asp Tyr Arg Ile Ala Cys Leu
785 790 795 800

Lys Pro Gly Lys Tyr Lys Val Ala Leu Asp Ser Asp Asp Pro Leu Phe
805 810 815

Gly Gly Phe Gly Arg Ile Asp His Asn Ala Glu Tyr Phe Thr Phe Glu
820 825 830

Gly Trp Tyr Asp Asp Arg Pro Arg Ser Ile Met Val Tyr Ala Pro Cys
835 840 845

Lys Thr Ala Val Val Tyr Ala Leu Val Asp Lys Glu Glu Glu Glu
850 855 860

Glu Glu Glu Glu Glu Glu Val Ala Ala Val Glu Glu Val Val Val Glu
865 870 875 880

Glu Glu

(2) INFORMATION FOR SEQ ID NO: 16:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2576 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 16:

TCATTAAAGA GGAGAAATTA ACTATGAGAG GATCTCACCA TCACCATCAC
CATGGGATCT 60

TGGCTGAAAA GTCTTCTTAC AATTCCGAAT TCCGACCTTC TACAGTTGCA
GCATCGGGGA 120

AAGTCCTTGT GCCTGGAACC CAGAGTGATA GCTCCTCATC CTCAACAAAC
CAATTTGAGT 180

TCACTGAGAC ATCTCCAGAA AATTCCCCAG CATCAACTGA TGTAGATAGT
TCAACAATGG 240

AACACGCTAG CCAGATTAAA ACTGAGAACG ATGACGTTGA
GCCGTCAAGT GATCTTACAG 300

GAAGTGTTGA AGAGCTGGAT TTTGCTTCAT CACTACAACT ACAAGAAGGT
GGTAAACTGG 360

AGGAGTCTAA AACATTAAAT ACTTCTGAAG AGACAATTAT TGATGAATCT
GATAGGATCA 420

GAGAGAGGGG CATCCCTCCA CCTGGACTTG GTCAGAAGAT
TTATGAAATA GACCCCCTTT 480

TGACAAACTA TCGTCAACAC CTTGATTACA GGTATTCACA GTACAAGAAA
CTGAGGGGAGG 540

CAATTGACAA GTATGAGGGT GGTTTGGAAG CTTTTTCTCG TGGTTATGAA
AAAATGGGTT 600

TCACTCGTAG TGCTACAGGT ATCACTTACC GTGAGTGGGC
TCCTGGTGCC CAGTCAGCTG 660

CCCTCATTGG AGATTTCAAC AATTGGGACG CAAATGCTGA CATTATGACT
CGGAATGAAT 720

TTGGTGTCTG GGAGATTTTT CTGCCAAATA ATGTGGATGG TTCTCCTGCA
ATTCCTCATG 780

GGTCCAGAGT GAAGATACGT ATGGACACTC CATCAGGTGT
TAAGGATTCC ATCCTGCTT 840

GGATCAACTA CTCTACAGCT TCCTGATGAA ATTCCATATA ATGGAATATA
TTATGATCCA 900

CCCGAAGAGG AGAGGTATAT CTTCCAACAC CCACGGCCAA
AGAAACCAAA GTCGCTGAGA 960

ATATATGAAT CTCATATTGG AATGAGTAGT CCGGAGCCTA AAATTAAGTC
ATACGTGAAT 1020

TTTAGAGATG AAGTTCTTCC TCGCATAAAA AAGCTTGGGT ACAATGCGCT
GCAAATTATG 1080

GCTATTCAAG AGCATTCTTA TTATGCTAGT TTTGGTTATC ATGTCACAAA
TTTTTTTGCA 1140

CCAAGCAGCC GTTTTGGAAC GCCCGACGAC CTTAAGTCTT TGATTGATAA
AGCTCATGAG 1200

CTAGGAATTG TTGTTCTCAT GGACATTGTT CACAGCCATG CATCAAATAA
TACTTTAGAT 1260

GGACTGAACA TGTTTGACGG CACCGATAGT TGTTACTTTC ACTCTGGAGC
TCGTGGTTAT 1320

CATTGGATGT GGGATTCCCG CCTTTTAAAC TATGGAAACT GGGAGGTACT
TAGGTATCTT 1380

CTCTCAAATG CGAGATGGTG GTTGGATGAG TTCAAATTTG ATGGATTAG
ATTTGATGGT 1440

GTGACATCAA TGATGTATAC TCACCACGGA TTATCGGTGG GATTCACTGG
GAACTACGAG 1500

GAATACTTTG GACTCGCAAC TGATGTGGAT GCTGTTGTGT ATCTGATGCT
GGTCAACGAT 1560

CTTATTCATG GGCTTTTCCC AGATGCAATT ACCATTGGTG AAGATGTTAG
CGGAATGCCG 1620

ACATTTTGTA TTCCCGTTCA AGATGGGGGT GTTGGCTTTG ACTATCGGCT
GCATATGGCA 1680

ATTGCTGATA AATGGATTGA GTTGCTCAAG AAACGGGATG
AGGATTGGAG AGTGGGTGAT 1740

ATTGTTCATA CACTGACAAA TAGAAGATGG TCGGAAAAGT GTGTTTCATA
CGCTGAAAGT 1800

CATGATCAAG CTCTAGTCGG TGATAAACT ATAGCATTCT GGCTGATGGA
CAAGGATATG 1860

TATGATTTTA TGGCTCTGGA TAGACCGCCA ACATCATTA TAGATCGTGG
GATAGCATTG 1920

CACAAGATGA TTAGGCTTGT AACTATGGGA TTAGGAGGAG
AAGGGTACCT AAATTTTCATG 1980

GGAAATGAAT TCGGCCACCC TGAGTGGATT GATTTCCCTA
GGGCTGAACA ACACCTCTCT 2040

GATGACTCAG TAATTCCCGG AAACCAATTC AGTTATGATA AATGCAGACG
GAGATTTGAC 2100

CTGGGAGATG CAGAATATTT AAGATACCGT GGGTTGCAAG AATTGACCG
GGCTATGCAG 2160

TATCTTGAAG ATAAATATGA GTTTATGACT TCAGAACACC AGTTCATATC
ACGAAAGGAT 2220

GAAGGAGATA GGATGATTGT ATTTGAAAAA GGAAACCTAG TTTTGTCTT
TAATTTTCAC 2280

TGGACAAAAA GCTATTCAGA CTATCGCATA GGCTGCCTGA AGCCTGGAAA
ATACAAGGTT 2340

GCCTTGGACT CAGATGATCC ACTTTTTGGT GGCTTCGGGA GAATTGATCA
TAATGCCGAA 2400

TATTTACCT TTGAAGGATG GTATGATGAT CGTCCTCGTT CAATTATGGT
GTATGCACCT 2460

TGTAGAACAG CAGTGGTCTA TGCACTAGTA GACAAAGAAG
AAGAAGAAGA AGAAGAAGAA 2520

GAAGAAGTAG CAGTAGTAGA AGAAGTAGTA GTAGAAGAAG
AATGAACGAA CTTGTG 2576

(2) INFORMATION FOR SEQ ID NO: 17:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2529 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 17:

GGATGCTAAT GTTCTGTAT TCTTGAAAAA GCACTCTCTT TCACGGAAGA
TCTTGGCTGA 60

AAAGTCTTCT TACAATTCCG AATCCCGACC TTCTACAGTT GCAGCATCGG
GGAAAGTCCT 120

TGTGCCTGGA AYCCAGAGTG ATAGCTCCTC ATCCTCAACA GACCAATTTG
AGTTCACTGA 180

GACATCTCCA GAAAATTCCC CAGCATCAAC TGATGTAGAT AGTTCAACAA
TGGAACACGC 240

TAGCCAGATT AAAACTGAGA ACGATGACGT TGAGCCGTCA AGTGATCTTA
CAGGAAGTGT 300

TGAAGAGCTG GATTTTGCTT CATCACTACA ACTACAAGAA GGTGGTAAAC
TGGAGGAGTC 360

TAAACATTA AATACTTCTG AAGAGACAAT TATTGATGAA TCTGATAGGA
TCAGAGAGAG 420

GGGCATCCCT CCACCTGGAC TTGGTCAGAA GATTTATGAA
ATAGACCCCC TTTTGACAAA 480

CTATCGTCAA CACCTTGATT ACAGGTATTC ACAGTACAAG AAACTGAGGG
AGGCAATTGA 540

CAAGTATGAG GGTGGTTTGG AAGCTTTTTC TCGTGGTTAT GAAAAAATGG
GTTTCACTCG 600

TAGTGCTACA GGTATCACTT ACCGTGAGTG GGCTCCTGGT
GCCCAGTCAG CTGCCCTCAT 660

TGGAGATTTC AACAATTGGG ACGCAAATGC TGACATTATG ACTCGGAATG
AATTTGGTGT 720

CTGGGAGATT TTTCTGCCAA ATAATGTGGA TGGTTCTCCT GCAATTCCTC
ATGGGTCCAG 780

AGTGAAGATA CGYATGGACA CTCCATCAGG TGTTAAGGAT TCCATTCCTG
CTTGGATCAA 840

CTACTCTTTA CAGCTTCCTG ATGAAATTCC ATATAATGGA ATATATTATG
ATCCACCCGA 900

AGAGGAGAGG TATRTCTTCC AACACCCACG GCCAAAGAAA
CCAAAGTCGC TGAGAATATA 960

TGAATCTCAT ATTGGAATGA GTAGTCCGGA GCCTAAAATT AACTCATACG
TGAATTTTAG 1020

AGATGAAGTT CTTCTCGCA TAAAAASCT TGGGTACAAT GCGGTGCAAA
TTATGGCTAT 1080

TCAAGAGCAT TCTTATTATG CTAGTTTTGG TTATCATGTC ACAAATTTT
TTGCACCAAG 1140

CAGCCGTTTT GGAACGCCCG ACGACCTTAA GTCTTTGATT GATAAAGCTC
ATGAGCTAGG 1200

AATTGTTGTT CTCATGGACA TTGTTACAG CCATGCATCA AATAATACTT
TAGATGGACT 1260

GAACATGTTT GACGGCACAG ATAGTTGTTA CTTTCACTCT GGAGCTCGTG
GTTATCATTG 1320

GATGTGGGAT TCCCGCCTCT TTAACATGG AACTGGGAG GTACTTAGGT
ATCTTCTCTC 1380

AAATGCGAGA TGGTGGTTGG ATGAGTTCAA ATTTGATGGA TTAGATTTG
ATGGTGTGAC 1440

ATCAATGATG TATACTCACC ACGGATTATC GGTGGGATTC ACTGGGAACT
ACGAGGAATA 1500

CTTTGGACTC GCAACTGATG TGGATGCTGT TGTGTATCTG ATGCTGGTCA
ACGATCTTAT 1560

TCACGGGCTT TTCCAGATG CAATTACCAT TGGTGAAGAT GTTAGCGGAA
TGCCGACATT 1620

TTGTATTCCC GTTCAAGATG GGGGTGTTGG CTTTGACTAT CGGCTGCATA
TGGCAATTGC 1680

TGATAAATGG ATTGAGTTGC TCAAGAAACG GGATGAGGAT
TGGAGAGTGG GTGATATTGT 1740

TCATACACTG ACAAATAGAA GATGGTCGGA AAAGTGTGTT TCATMCGCTG
AAAGTCATGA 1800

TCAAGCTCTA GTCGGTGATA AACTATAGC ATYCTGGCTG ATGGACAAGG
ATATGTATGA 1860

TTTTATGGCT CTGGATAGAC CGYCAACAYC ATTAATAGAT CGTGGGATAG
CATTGCACAA 1920

GATGATTAGG CTTGTA ACTA TGGGATTAGG AGGAGAAGGG TACCTAAATT
TCATGGGAAA 1980

TGAATTCGGC CACCCTGAGT GGATTGATTT CCCTAGGGCT
GARCAACACC TCTCTGATGG 2040

CTCAGTAATT CCCGGAAACC AATTCAGTTA TGATAAATGC AGACGGAGAT
TTGACCTGGG 2100

AGATGCAGAA TATTTAAGAT ACCATGGGTT GCAAGAATTT GACCGGGCTA
TGCAGTATCT 2160

TGAAGATAAA TATGAGTTTA TGA CTTT CAGA ACACCAGTTC ATATCACGAA
AGGATGAAGG 2220

AGATAGGATG ATTGTATTTG AAARAGGAAA CCTAGTTTTT GTCTTTAATT
TTC ACTGGAC 2280

AAATAGCTAT TCAGACTATC GCATAGGCTG CCTGAAGCCT GGAAAATACA
AGGTTGGCTT 2340

GGACTCAGAT GATCCACTTT TTGGTGGCTT CGGGAGAATT GATCATAATG
CCGAATATTT 2400

CACCTCTGAA GGATCGTATG ATGATCGTCC TCGTTCAATT ATGGTGTATG
CACCTAGTAG 2460

AACAGCAGTG GTCTATGCAC TAGTAGACAA ANTAGAAGNA
GAAGAAGAAG AAGAANCCGN 2520

NGAAGAATT 2529

(2) INFORMATION FOR SEQ ID NO: 18:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 3231 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 18:

GATTTAATAC GACTCACTAT AGGGATTTTT TTTTTTTTTT TTTTAAAAAC
CTCCTCCACT 60

CAGTCTTGGG ATCTCTCTCT CTCTTCACGC TTCTCTTGGG GCCTTGAAC
CAGCAATTTG 120

ACACTCAGTT AGTTACACTC CTATCACTCA TCAGATCTCT ATTTTTTCTC
TTAATTCCAA 180

CCAAGGAATG AATTAAAAGA TTAGATTTGA AGGAGAGAAG AAGAAAGATG
GTGTATACAC 240

TCTCTGGAGT TCGTTTTCTT ACTGTTCCAT CAGTGTACAA ATCTAATGGA
TTCAGCAGTA 300

ATGGTGATCG GAGGAATGCT AATGTTTCTG TATTCTTGAA AAAGCACTCT
CTTTCACGGA 360

AGATCTTGGC TGAAAAGTCT TCTTACGATT CCGAATCCCG ACCTTCTACA
GTTGCAGCAT 420

CGGGGAAAGT CTTGTACCT GGAATCCAGA GTGATAGCTC
CTCATCCTCA ACAGACCAAT 480

TTGAGTTCAC TGAGACAGCT CCAGAAAATT CCCAGCATC AACTGATGTG
GATAGTTCAA 540

CAATGGAACA CGCTAGCCAG ATTAAAACTG AGAACGATGA
CGTTGAGCCG TCAAGTGATC 600

TTACAGGAAG TGTTGAAGAG TTGGATTTTG CTTCACTACT ACAACTACAA
GAAGGTGGTA 660

AACTGGAGGA GTCTAAAACA TTAAATACTT CTGAAGAGAC AATTATTGAT
GAATCTGATA 720

GGATCAGAGA GAGGGGCATC CCTCCACCTG GACTTGGTCA
GAAGATTTAT GAAATAGACC 780

CCCTTTTGAC AAACATATCGT CAACACCTTG ATTACAGGTA TTCACAGTAC
AAGAAAATGA 840

GGGAGGCAAT TGACAAGTAT GAGGGTGGTT TGGAAGCTTT
TTCTCGTGGT TATGAAAAA 900

TGGGTTTCAC TCGTAGTGCT ACAGGTATCA CTTACCGTGA GTGGGCTCCT
GGTGCCCAGT 960

CAGCTGCTCT CATTGGAGAT TTCAACAATT GGGACGCAA TGCTGACATT
ATGACTCGGA 1020

ATGAATTTGG TGTCTGGGAG ATTTTCTGC CAAATAATGT GGATGGTTCT
CCTGCAATTC 1080

CTCATGGGTC CAGAGTGAAG ATACGCATGG ACACTTCATC
AGGTGTTAAG GATTCCATTC 1140

CTGCTTGGAT CAACTACTCT TTACAGCTTC CTGATGAAAT TCCATATAAT
GGAATATATT 1200

ATGATCCACC CGAAGAGGAG AGGTATGTCT TCCAACACCC
ACGGCCAAAG AAACCAAAGT 1260

CGCTGAGAAT ATATGAATCT CATATTGGAA TGAGTAGTCC GGAGCCTAAA
ATTAATCAT 1320

ACGTGAATTT TAGAGATGAA GTTCTTCCTC GCATAAAAAA CCTTGGGTAC
AATGCGGTGC 1380

AAATTATGGC TATTCAAGAG CATTCTTATT ATGCTAGTTT TGGTTATCAT
GTCACAAATT 1440

TTTTTGCACC AAGCAGCCGT TTTGGAACGC CCGACGACCT TAAGTCTTTG
ATTGATAAAG 1500

CTCATGAGCT AGGAATTGTT GTTCTCATGG ACATTGTTCA CAGCCATGCA
TCAAATAATA 1560

CTTTAGATGG ACTGAACATG TTTGACGGCA CAGATAGTTG TTA CTTTCAC
TCTGGAGCTC 1620

GTGGTTATCA TTGGATGTGG GATTCCCGCC TCTTTAACTA TGGAAACTGG
GAGGTACTTA 1680

GGTATCTTCT CTCAAATGCG AGATGGTGGT TGGATGAGTG CAAATTTGRT
GGATTTAGAT 1740

TTGATGGTGT GACATCAATG ATGTATACTC ACCACGGATT ATCGGTGGGA
TTCAGTGGGA 1800

ACTACGAGGA ATACTTTGGA CTCGCAACTG ATGTRGATGC TGCCGTGTAT
CTGATGCTGG 1860

CCAACGATCT TATTCATGGG CTTTCCCAG ATGCAATTAC CATTGGTGAA
GATGTTAGCG 1920

GAATGCCGAC ATTTTGTATT CCCGTTCAAG ATGGGGGTGT TGGCTTTGAC
TATCGGCTGC 1980

ATATGGCAAT TGCTGATAAA TGGATTGAGT TGCTCAAGAA ACGGGATGAG
GATTGGAGAG 2040

TGGGTGATAT TGTTTCATACA CTGACAAATA GAAGATGGTC GGAAAAGTGT
GTTTCATACG 2100

CTGAAAGTCA TGATCAAGCT CTAGTCGGTG ATAAACTAT AGCATTCTGG
CTGATGGACA 2160

AGGATATGTA TGATTTTATG GCTTTGGATA GACCGTCAAC ATCATTAATA
GATCGTGGGA 2220

TAGCATTGCA CAAGATGATT AGGCTTGTA CTATGGGATT AGGAGGAGAA
GGGTACCTAA 2280

ATTCATGGG AAATGAATTC GGCCACCCTG AGTGGATTGA TTTCCCTAGG
GCTGAACAAC 2340

ACCTCTCTGA TGGCTCAGTA ATTCCCGGAA ACCAATTCAG TTATGATAAA
TGCAGACGGA 2400

GATTTGACCT GGGAGATGCA GAATATTTAA GATACCGTGG GTTGCAAGAA
TTTGACCGGG 2460

CTATGCAGTA TCTTGAAGAT AAATATGAGT TTATGACTTC AGAACACCAG
TTCATATCAC 2520

GAAAGGATGA AGGAGATAGG ATGATTGTAT TTGAAAAAGG AAACCTAGTT
TTTGTCTTTA 2580

ATTTTCACTG GACAAAAAGC TATTCAGACT ATCGCATAGG CTGGCTGAAG
CCTGGAAAAT 2640

ACAAGGTTGC CTTGGACTCA GATGATCCAC TTTTGGTGG
CTTCGGGAGA ATTGATCATA 2700

ATGCCGAATG TTTCACCTTT GAAGGATGGT ATGATGATCG TCCTCGTTCA
ATTATGGTGT 2760

ATGCACCTAG TAGAACAGCA GTGGTCTATG CACTAGTAGA CAAAGAAGAA
GAAGAAGAAG 2820

AAGTAGCAGT AGTAGAAGAA GTAGTAGTAG AAGAAGAATG AACGAACTTG
TGATCGCGTT 2880

GAAAGATTTG AACGCTACAT AGAGCTTCTT GACGTATCTG GCAATATTGC
ATCAGTCTTG 2940

GCGGAATTTT ATGTGACAAA AGGTTTGCAA TTCTTTCCAC TATTAGTAGT
GCAACGATAT 3000

ACGCAGAGAT GAAGTGCTGA ACAAACATAT GTAAAATCGA TGAATTTATG
TCGAATGCTG 3060

GGACGGGCTT CAGCAGGTTT TGCTTAGTGA GTTCTGTAAA TTGTCATCTC
TTTANATGTA 3120

CAGCCCACTA GAAATCAATT ATGTGAGACC TAAAAAACAA TAACCATAAA
ATGGAAATAG 3180

TGCTGATCTA ATGATGTTTT AANCCNNNNA AAAAAAAAAA AAAAAGCTCGA
G 3231

(2) INFORMATION FOR SEQ ID NO: 19:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2578 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 19:

TCATTAAAGA GGAGAAATTA ACTATGAGAG GATCTCACCA TCACCATCAC
CATGGGATCT 60

TGGCTGAAAA GTCTTCTTAC AATTCCGAAT TCCGACCTTC TACAGTTGCA
GCATCGGGGA 120

AAGTCCTTGT GCCTGGAACC CAGAGTGATA GCTCCTCATC CTCAACAAAC
CAATTTGAGT 180

TCACTGAGAC ATCTCCAGAA AATTCCCCAG CATCAACTGA TGTAGATAGT
TCAACAATGG 240

AACACGCTAG CCAGATTAAA ACTGAGAACG ATGACGTTGA
GCCGTCAAGT GATCTTACAG 300

GAAGTGTTGA AGAGCTGGAT TTTGCTTCAT CACTACAACT ACAAGAAGGT
GGTAAACTGG 360

AGGAGTCTAA AACATTAAAT ACTTCTGAAG AGACAATTAT TGATGAATCT
GATAGGATCA 420

GAGAGAGGGG CATCCCTCCA CCTGGACTTG GTCAGAAGAT
TTATGAAATA GACCCCCTTT 480

TGACAAACTA TCGTCAACAC CTTGATTACA GGTATTCACA GTACAAGAAA
CTGAGGGGAGG 540

CAATTGACAA GTATGAGGGT GGTTTGGAAG CTTTTTCTCG TGGTTATGAA
AAAATGGGTT 600

TCACTCGTAG TGCTACAGGT ATCACTTACC GTGAGTGGGC
TCCTGGTGCC CAGTCAGCTG 660

CCCTCATTGG AGATTTCAAC AATTGGGACG CAAATGCTGA CATTATGACT
CGGAATGAAT 720

TTGGTGTCTG GGAGATTTTT CTGCCAAATA ATGTGGATGG TTCTCCTGCA
ATTCCTCATG 780

GGTCCAGAGT GAAGATACGT ATGGACACTC CATCAGGTGT
TAAGGATTCC ATTCCTGCTT 840

GGATCAACTA CTCTTCACAG CTTCTGATG AAATTCCATA TAATGGAATA
TATTATGATC 900

CACCCGAAGA GGAGAGGTAT ATCTTCCAAC ACCCACGGCC
AAAGAAACCA AAGTCGCTGA 960

GAATATATGA ATCTCATATT GGAATGAGTA GTCCGGAGCC TAAAATTAAC
TCATACGTGA 1020

ATTTTAGAGA TGAAGTTCTT CCTCGCATAA AAAAGCTTGG GTACAATGCG
GTGCAAATTA 1080

TGGCTATTCA AGAGCATTCT TATTATGCTA GTTTTGGTTA TCATGTCACA
AATTTTTTTG 1140

CACCAAGCAG CCGTTTTGGA ACGCCCGACG ACCTTAAGTC TTTGATTGAT
AAAGCTCATG 1200

AGCTAGGAAT TGTTGTTCTC ATGGACATTG TTCACAGCCA TGCATCAAAT
ATACTTTAG 1260

ATGGACTGAA CATGTTTGAC GGCACCGATA GTTGTTACTT TCACTCTGGA
GCTCGTGGTT 1320

ATCATTGGAT GTGGGATTCC CGCCTTTTTA ACTATGGAAA CTGGGAGGTA
CTTAGGTATC 1380

TTCTCTCAAA TGCGAGATGG TGGTTGGATG AGTTCAAATT TGATGGATTT
AGATTTGATG 1440

GTGTGACATC AATGATGTAT ACTCACCACG GATTATCGGT GGGATTCACT
GGGAACACG 1500

AGGAATACTT TGGACTCGCA ACTGATGTGG ATGCTGTTGT GTATCTGATG
CTGGTCAACG 1560

ATCTTATTCA TGGGCTTTTC CCAGATGCAA TTACCATTGG TGAAGATGTT
AGCGGAATGC 1620

CGACATTTTG TATTCCCGTT CAAGATGGGG GTGTTGGCTT TGAATATCGG
CTGCATATGG 1680

CAATTGCTGA TAAATGGATT GAGTTGCTCA AGAAACGGGA TGAGGATTGG
AGAGTGGGTG 1740

ATATTGTTCA TCACTGACA AATAGAAGAT GGTCGGAAAA GTGTGTTTCA
TACGCTGAAA 1800

GTCATGATCA AGCTCTAGTC GGTGATAAAA CTATAGCATT CTGGCTGATG
GACAAGGATA 1860

TGTATGATTT TATGGCTCTG GATAGACCGC CAACATCATT AATAGATCGT
GGGATAGCAT 1920

TGCACAAGAT GATTAGGCTT GTAACATGG GATTAGGAGG
AGAAGGGTAC CTAAATTTCA 1980

TGGGAAATGA ATTCGGCCAC CCTGAGTGA TTGATTTCCC
TAGGGCTGAA CAACACCTCT 2040

CTGATGACTC AGTAATTCCC GGAAACCAAT TCAGTTATGA TAAATGCAGA
CGGAGATTTG 2100

ACCTGGGAGA TGCAGAATAT TTAAGATACC GTGGGTTGCA AGAATTTGAC
CGGGCTATGC 2160

AGTATCTTGA AGATAAATAT GAGTTTATGA CTTCAGAACA CCAGTTCATA
TCACGAAAGG 2220

ATGAAGGAGA TAGGATGATT GTATTTGAAA AAGGAAACCT AGTTTTTGTC
TTTAATTTTC 2280

ACTGGACAAA AAGCTATTCA GACTATCGCA TAGGCTGCCT
GAAGCCTGGA AAATACAAGG 2340

TTGCCTTGGA CTCAGATGAT CCACTTTTTG GTGGCTTCGG GAGAATTGAT
CATAATGCCG 2400

AATATTTTAC CTTTGAAGGA TGGTATGATG ATCGTCCTCG TTCAATTATG
GTGTATGCAC 2460

CTTGTAGAAC AGCAGTGGTC TATGCACTAG TAGACAAAGA AGAAGAAGAA
GAAGAAGAAG 2520

AAGAAGAAGT AGCAGTAGTA GAAGAAGTAG TAGTAGAAGA
AGAATGAACG AACTTGTG 2578

(2) INFORMATION FOR SEQ ID NO: 20:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 23 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 20:

AATTTYATGG GNAAYGARTT YGG

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